Lead By Example!

Geothermal Projects for NYS Facilities

Moderator: Jack DiEnna / *GEO NII*

Panel: Indu Lnu / *University at Albany*

Jim Morier / *NYS DEC*

Lachlan Squair / *SUNY Oneonta*

POLICY & PROGRAMS • ROOM M2A • 11:45 – 12:45 PM

UNIVERSITY AT ALBANY
State University of New York

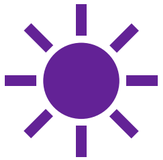
Role of Geothermal in Campus Decarbonization

Indu Lnu
University Energy Officer
518-442-3183
ilnu@albany.edu

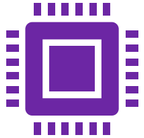
COMPONENTS OF A DECARBONIZED CAMPUS

Energy efficient buildings with low Energy Use Intensity

Low temperature thermal energy networks + beneficial electrification



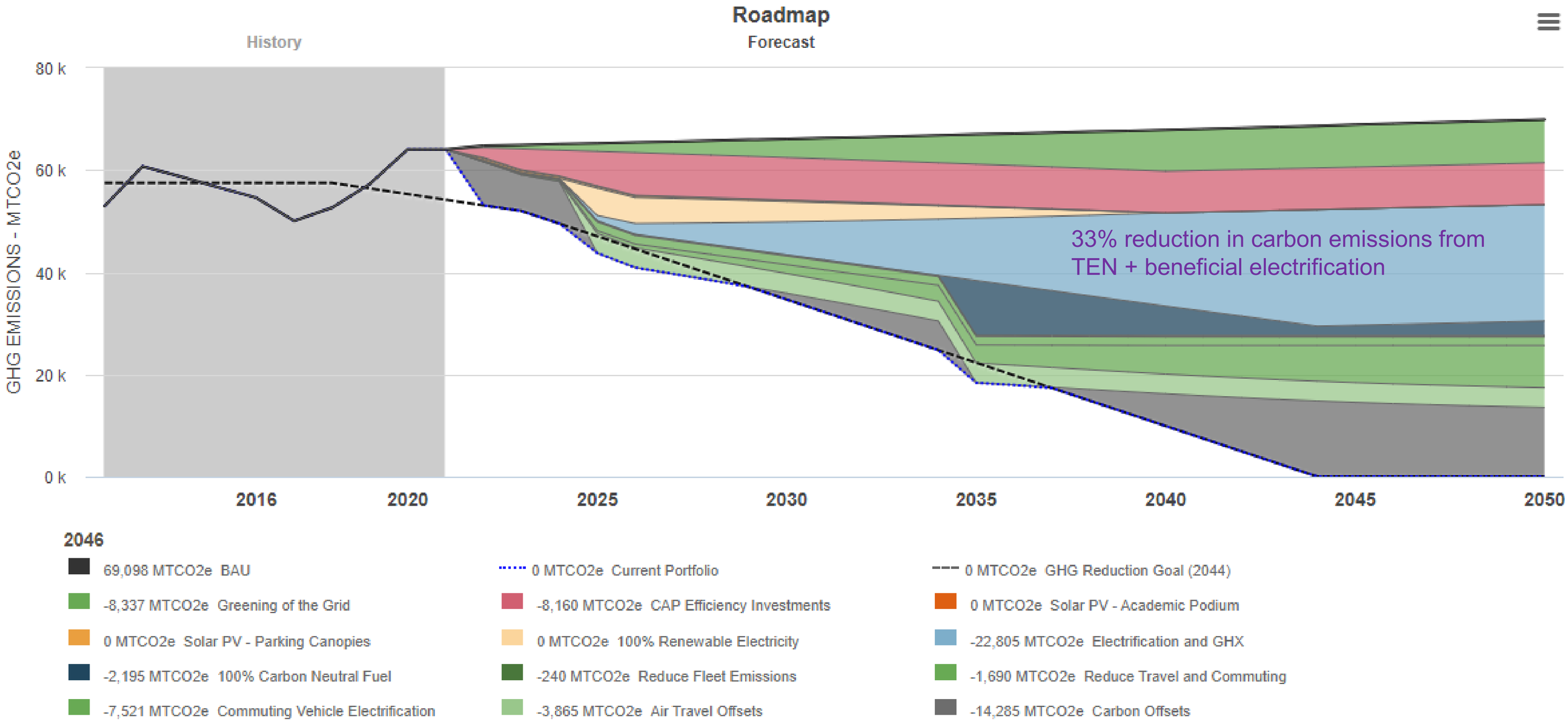
Renewable energy generation that matches campus use profile 24x7x365



Advanced data-driven operations/grid connectivity/smart buildings

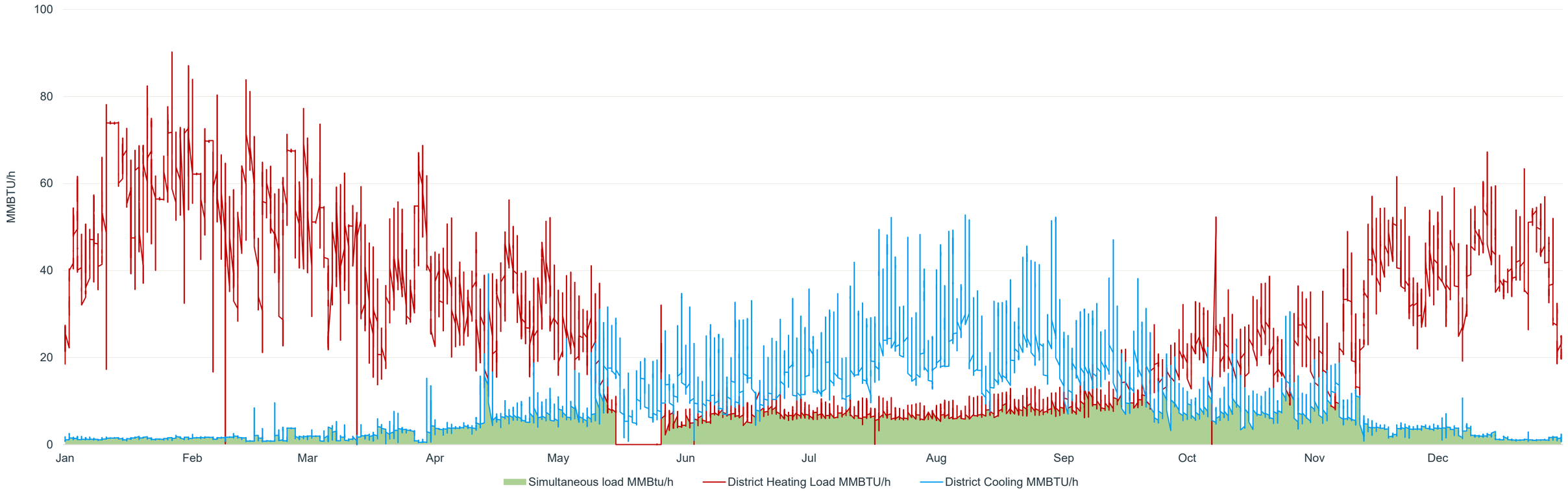
Well trained operators and educated and engaged users

ROADMAP FOR DECARBONIZED UALBANY



Existing Conditions

Existing heating network	Existing cooling network
• Generated by fossil fuels • 400°F supply with 150 ΔT • 90 MMBTU peak district heating load	• Rejects heat to atmosphere • 42°F supply with 16 ΔT • 4,400 tons peak district cooling load



ROLE OF GEOTHERMAL BOREFIELD

Buildings using LTHW (<160°F): Phase 1, 0-5 years

Buildings using 180°F-200°F: Phase 2, 6-10 years

Buildings using HTHW: Phase 3, 11-20 years

Thermal Energy Network: geothermal well field (dotted green area), LTHW distribution network (red line), Great Dane Heat Recovery Plant (purple boxes)

LIBERTY TERRACE AND ETEC CENTRAL PLANT UPGRADES

246,000 SF Lab Building, 2021

191,000 SF, 500-bed residential, 2012

1.9 MW rooftop solar PV

- ✓ Lowest Life Cycle option
- ✓ Liberty Terrace has 40% lower EUI with air-conditioning when compared to the other quads
- ✓ ETEC has an EUI of <65,000 Btu/SF/Year!
- ✓ Lower electrical capacity: ETEC peak load is 1MW
- ✓ No onsite fossil fuel and associated emissions
- ✓ Water savings: no cooling towers
- ✓ Comfort: Air Conditioning
- ✓ Lower O&M costs
- ✓ Resiliency: location of equipment, thermal energy storage

LESSONS LEARNT

- Do not forget about heat of compression
  - Even at Liberty Terrace, heat rejected to the borefield > heat extracted. Balance point of 45F
- Don’t oversize the borefield
  - Know your annual loads in addition to peaks
  - Review HP COP vs. EWT
- Maximize pumping efficiency
- Data collection is critical

NEW YORK STATE

Department of Environmental Conservation

GEOTHERMAL PROJECTS AT NYS DEC

Jim Morier, PE

NYS DEC – Division of Operations

April 24, 2025


CONSIDERATIONS

Considerations for DEC Projects

- Envelope Considerations
- System Considerations
  - System Type – Air Source vs Ground Source, Bore Field vs Horizontal Loop etc.
  - Climate – Need to Balance Loads
  - Central System or Distributed Heat Pumps
  - Full Electrification or Hybrid
  - Emergency Operations (Backup Power Needs)
- Right Sizing
  - 60% capacity can cover 90% of the load

AT A GLANCE

DEC Geothermal Systems

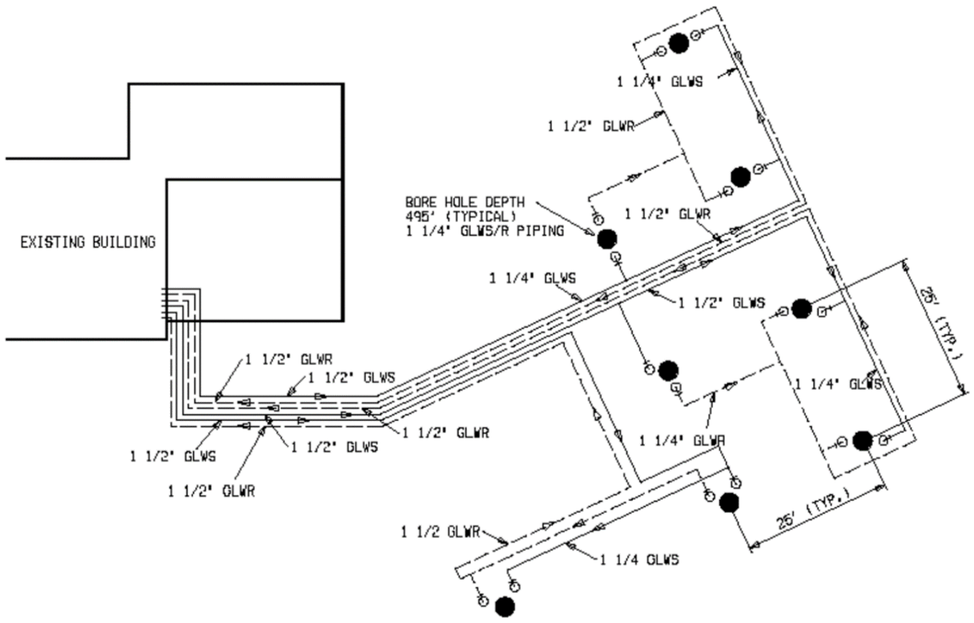
DEC Geothermal Systems					
Facility	**Status**	**Year Built/Sched.**	**Ground Couple**	**Num. Wells or Loop Length**	**Capacity (tons)**
Five Rivers EEC	Existing	2011	Bore Field	7 - 495' deep wells	36.25
Godfrey Point Sign Shop	Existing	2011	Horizontal Loop	6 - 1,000' HDPE loops	10
Mt. Loretto MC	Existing	2023	Horizontal Loop	4 - 1,000' HDPE loops	5
New Paltz ROB	Existing	2007	Bore Field	24 - 417' deep wells	90
Stony Kill Farm EEC	Existing	2006	Bore Field	6 - 400' deep wells	15.5
Van Hornesville Fish Hatchery	Existing	2021	Open well	Utilizes the overflowing domestic artesian well	3
Cortland Regional Sub-office	Design	2026	Bore Field	12 - 600' deep wells	34
Northville Regional Sub-office	Design	2027	Bore Field	6 - 495' deep wells	16.25
Ray Brook Regional Office	Design	2026	Bore Field	24 - 495' deep wells	71.5
Cleveland Law Enforcement Academy	Pre-Design - Program Report	2028	Bore Field	TBD	TBD
Reinstein Woods EEC	Pre-Design - Program Report	2028	Bore Field	TBD	TBD


EXISTING PROJECTS

Five Rivers Environmental Education Center

Delmar, NY

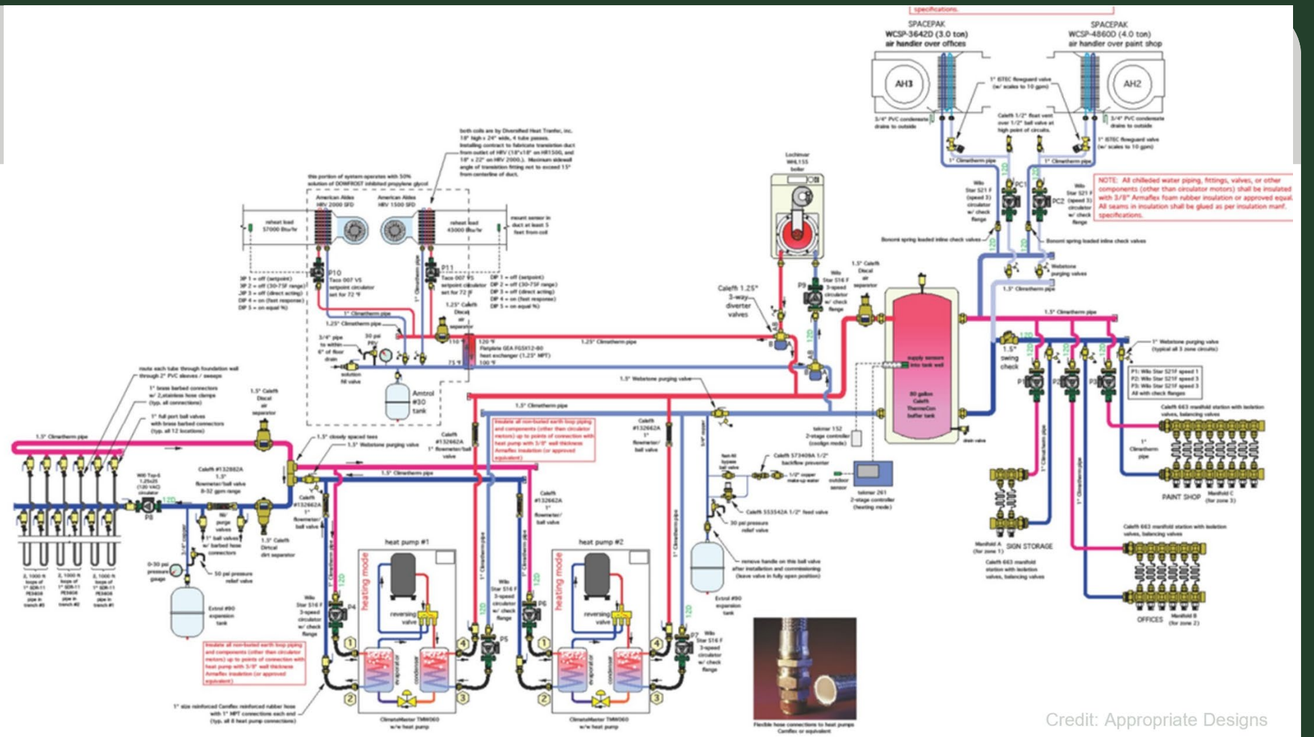
- Bore field - 2011 New Construction
  - Comprised of seven, 495 ft wells
- Capacity: 36.25 tons
- LEED Platinum Building



Godfrey Point Sign Shop

Cleveland, NY

- Horizontal loop - 2011 New Construction
  - Comprised of six 1,000 ft HDPE loops
- Capacity: 10 tons (2, 5-ton units)



Credit: Appropriate Designs

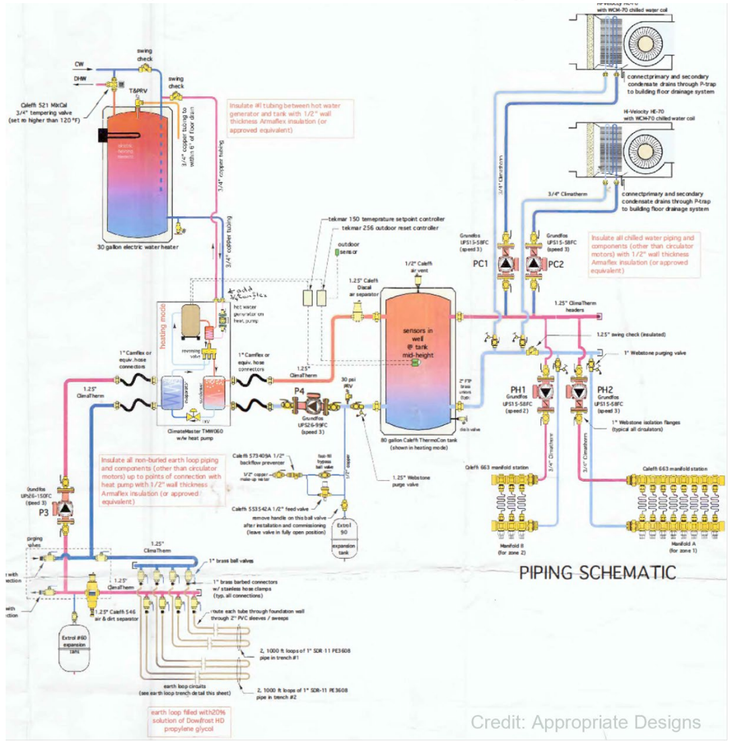
Mt. Loretto Maintenance Center

Mt. Loretto Unique Area, Staten Island, NY

- Horizontal loop - 2023 New Construction
  - Comprised of four* 1,000ft HDPE loops

**One of the loops had a leak caused by improper backfill – system is running fine on only three loops*

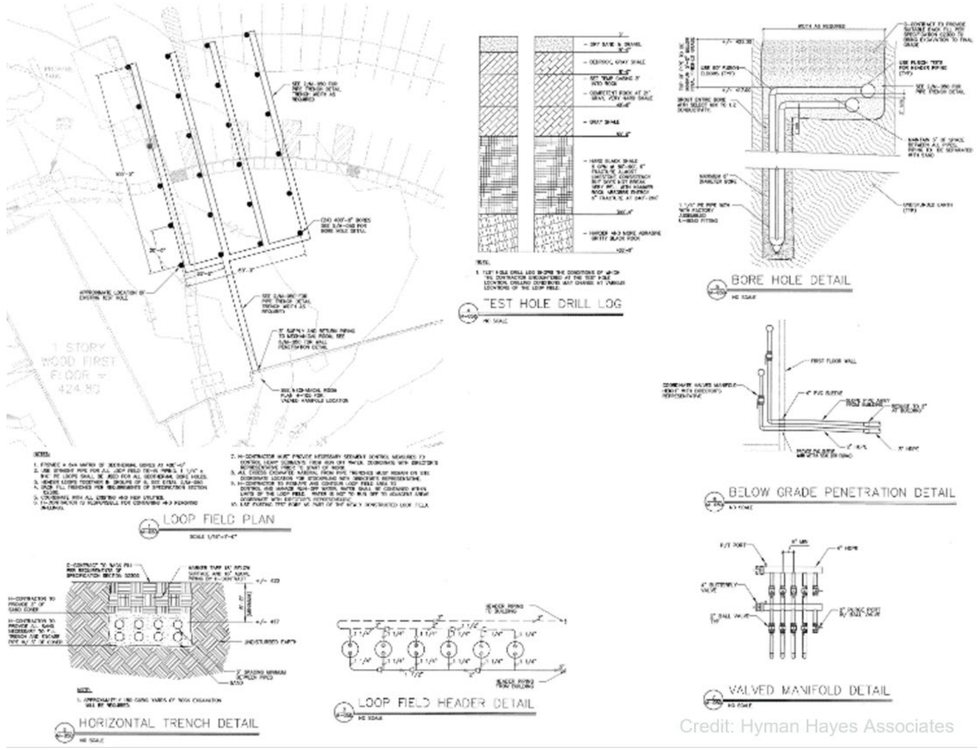
- Capacity: 5 tons



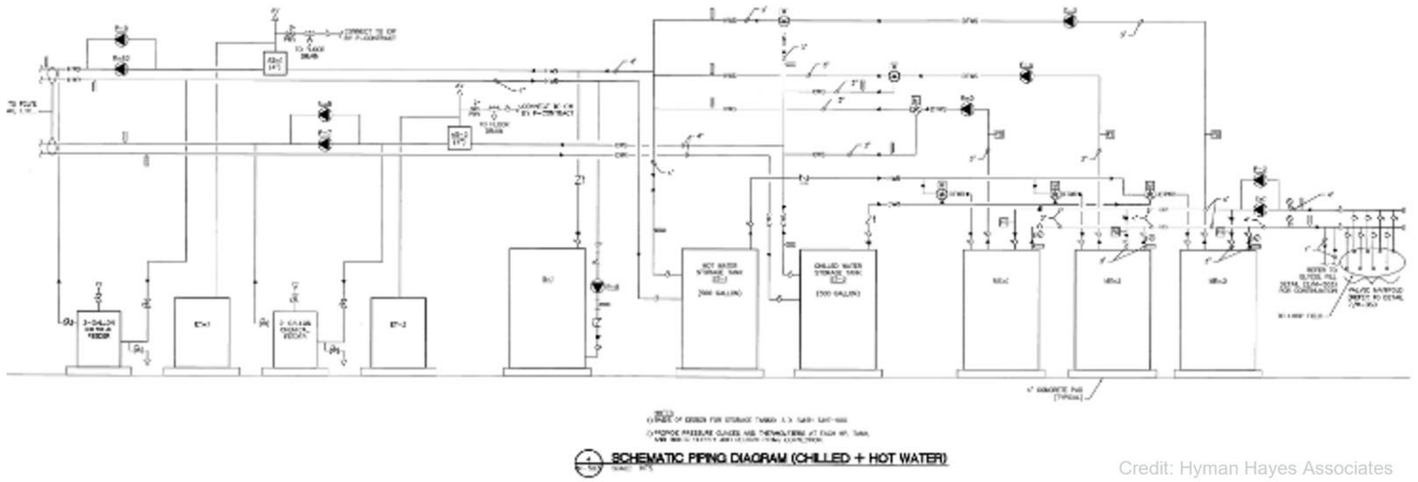
New Paltz Regional Office Building

New Paltz, NY

- Bore field - 2007 Renovation & Addition
  - Comprised of twenty-four, 417 ft wells
- Capacity: 90 tons (3, 30-ton units)



Credit: Hyman Hayes Associates

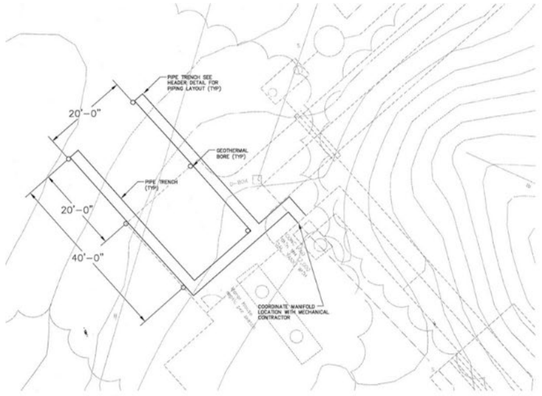


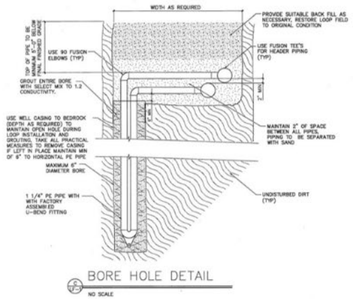
Credit: Hyman Hayes Associates

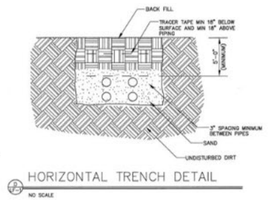
Stony Kill Farm Environmental Education Center

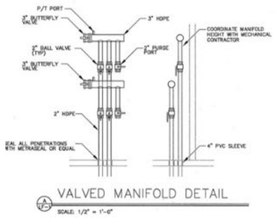
Wappingers Falls, NY

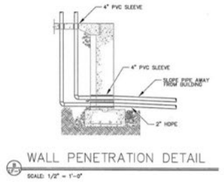
- Bore field - 2006 New Construction
  - Comprised of six, 400 ft wells
- Capacity: 15.5 tons

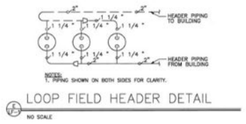




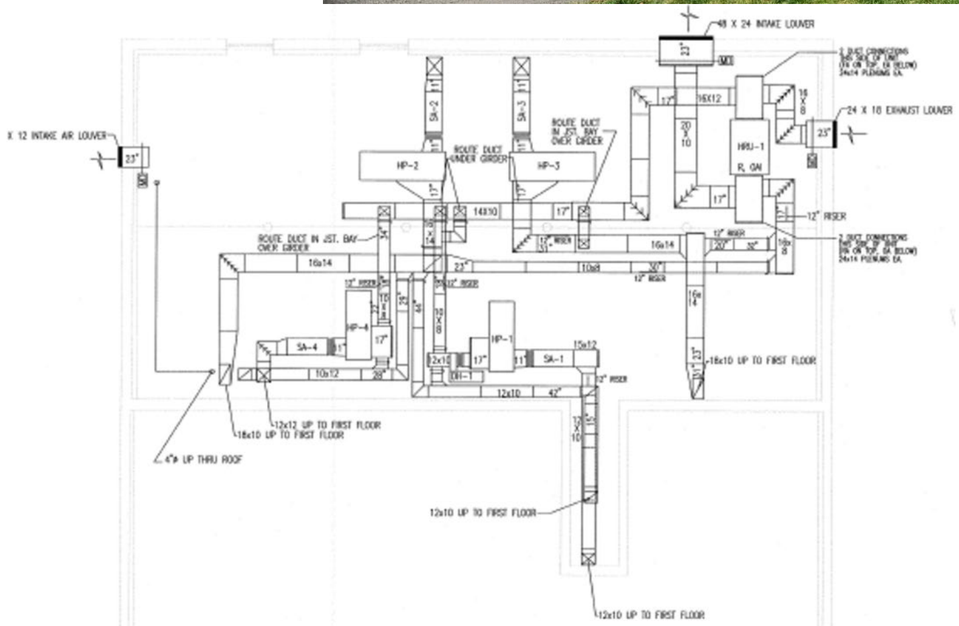








Credit: Shumaker Consulting

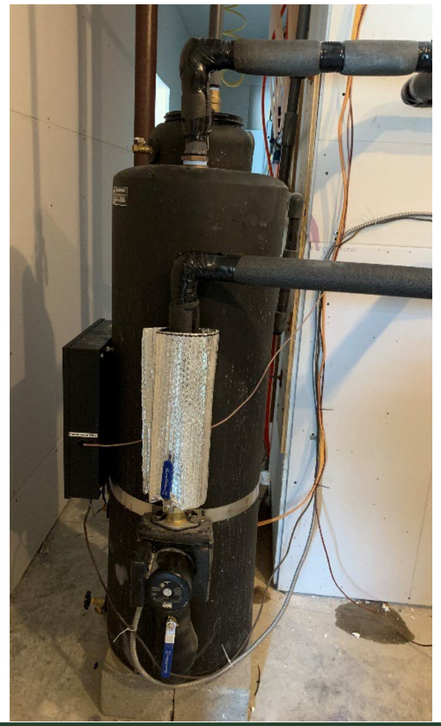


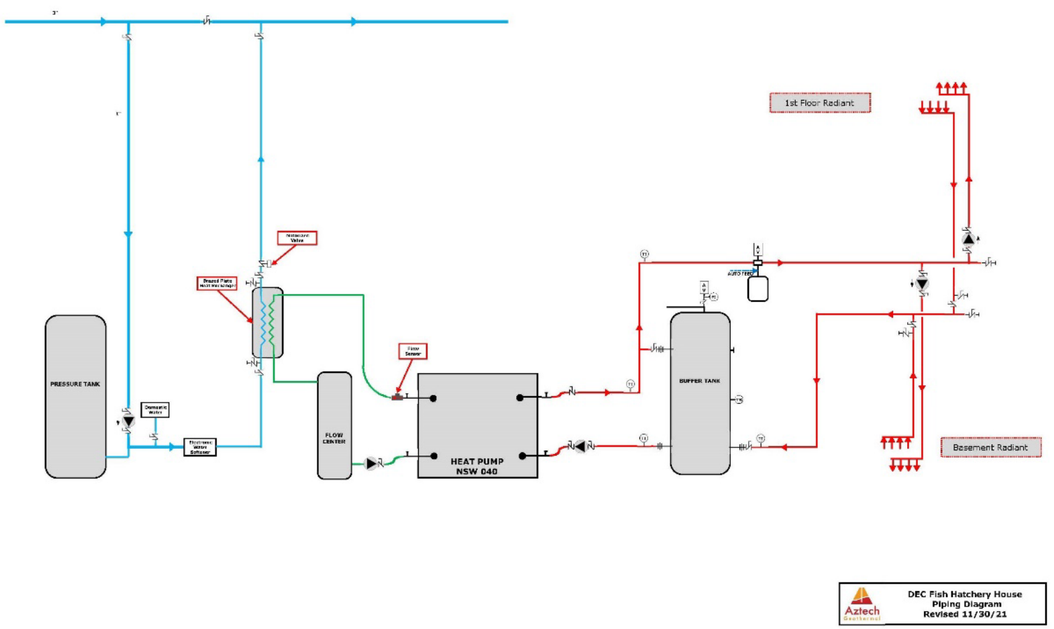
Credit: D.J. Heating & Air Conditioning Inc.

Van Hornesville Fish Hatchery

Van Hornesville, NY

- Open well - 2021 New Construction & Process Improvement
  - Utilizes 40 gpm artesian well for HVAC and Fish Prod.
- Capacity: 3 tons



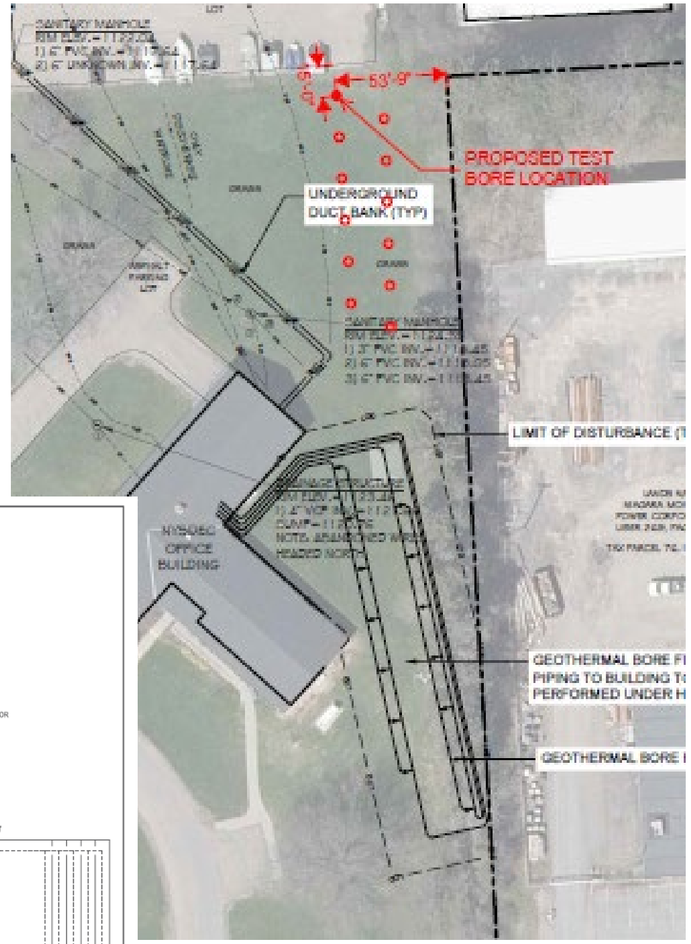


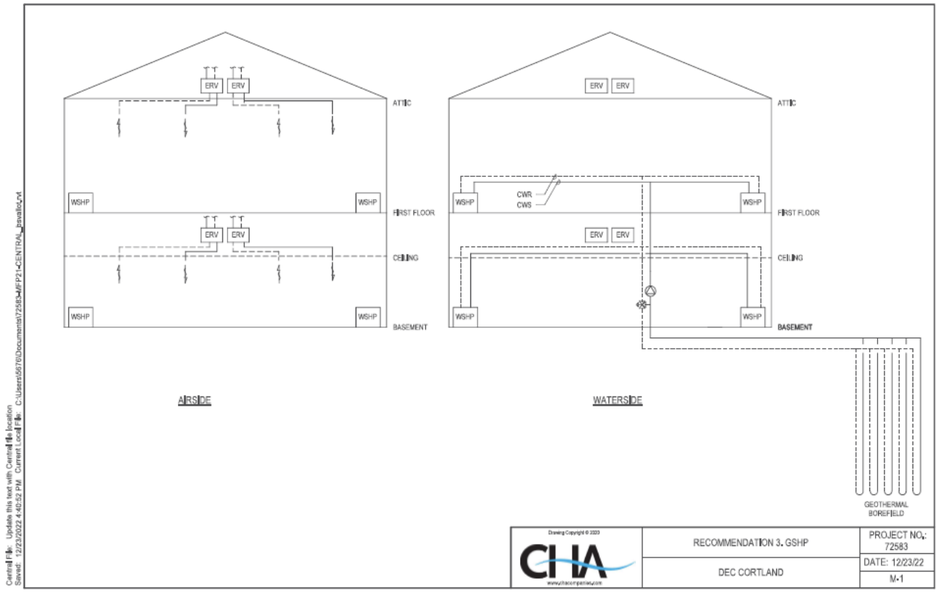

PLANNED PROJECTS

Cortland Regional Sub-office

Cortland, NY

- Bore field - Electrification of Existing Building
  - Initially planned for fourteen, 500ft wells
  - Recently changed design to twelve, 600ft wells
- Planned capacity: 34 tons

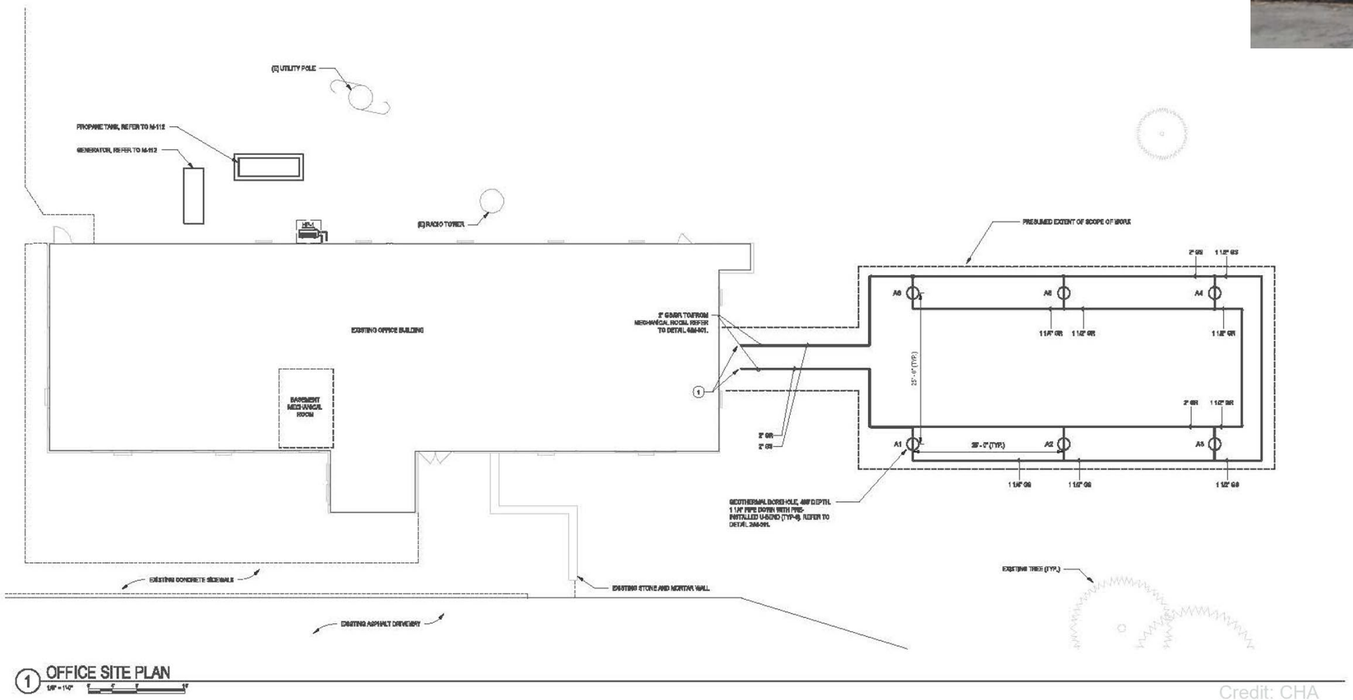




Northville Regional Sub-office

Northville, NY

- Bore field - Electrification of Existing Building
  - Will be comprised of six, 495ft wells
- Planned capacity: 16.25 tons

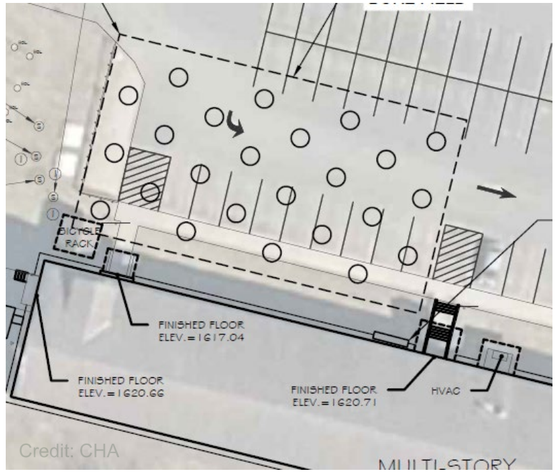


Credit: CHA

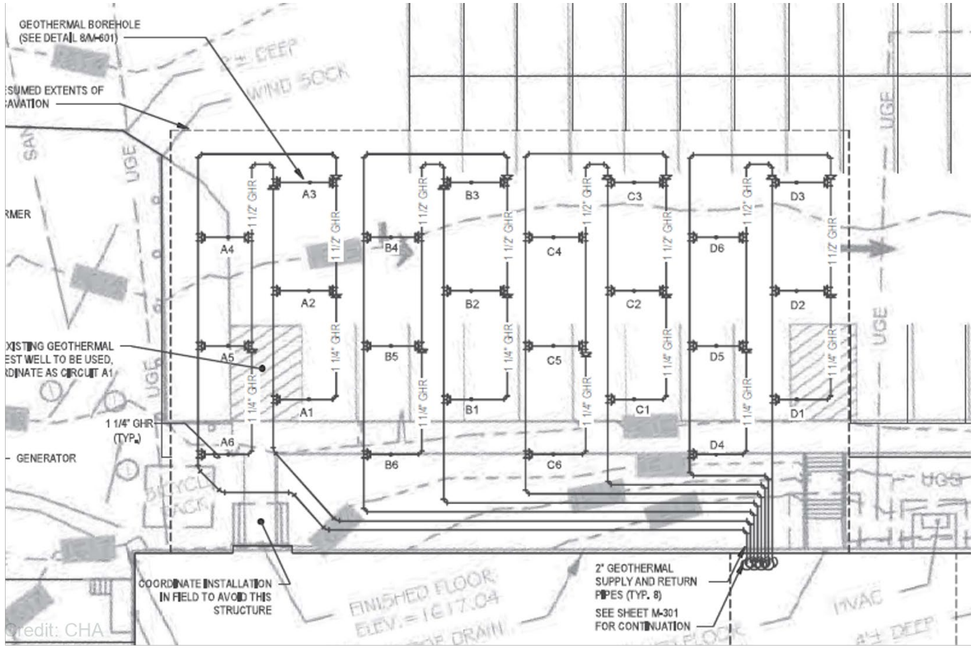
Ray Brook Regional Sub-office

Ray Brook, NY

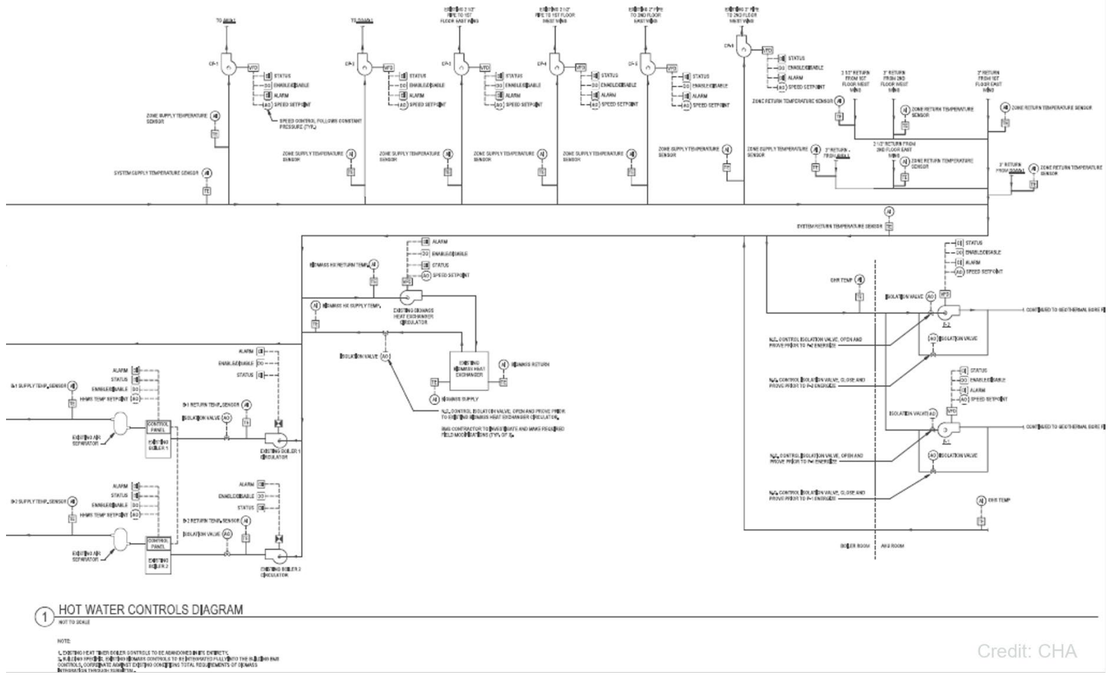
- Bore field - Electrification of Existing Building
  - Will be comprised of twenty-four, 495ft wells
- Planned capacity: 71.5 tons



Credit: CHA



Credit: CHA



Credit: CHA

Pre-Design

- Cleveland Law Enforcement Academy
  - **Cleveland, NY**
  - Scheduled 2028
  - Conversion of 1960’s School Building
  - Bore field - 2 Test Wells Installed

- Reinstein Woods EEC
  - **Depew, NY**
  - Scheduled 2028
  - Major Reno & Addition
  - Bore field

Department of Environmental Conservation

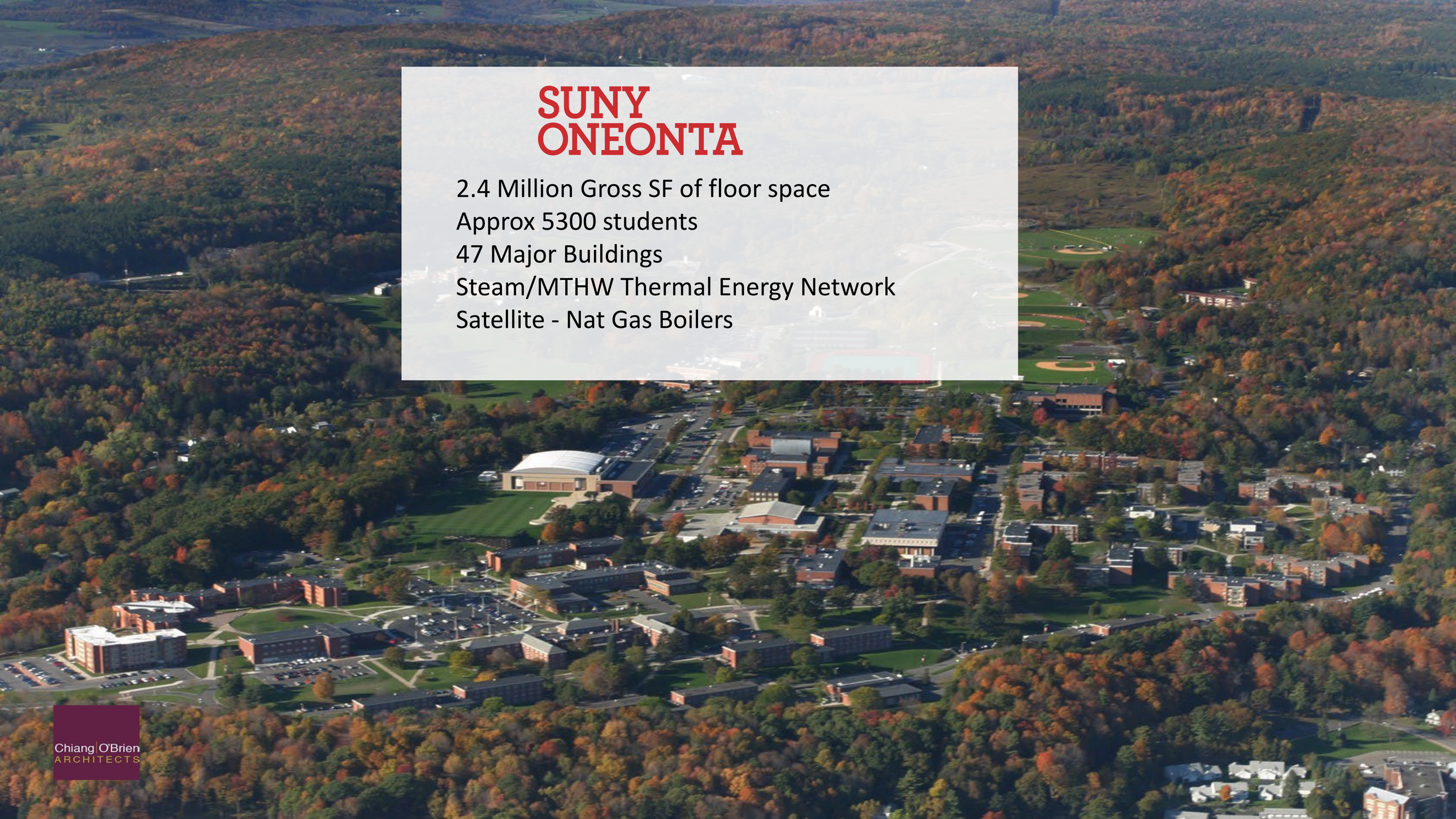
Jim Morier, PE
Section Chief, Energy & Decarbonization
Division of Operations
James.Morier@dec.ny.gov

SUNY ONEONTA

Clean Energy Master Plan
Geothermal Installations

Lachlan Squair
Associate Vice President - Facilities & Planning

Chiang | O'Brien
ARCHITECTS



SUNY ONEONTA

2.4 Million Gross SF of floor space
Approx 5300 students
47 Major Buildings
Steam/MTHW Thermal Energy Network
Satellite - Nat Gas Boilers

Chiang | O'Brien
ARCHITECTS

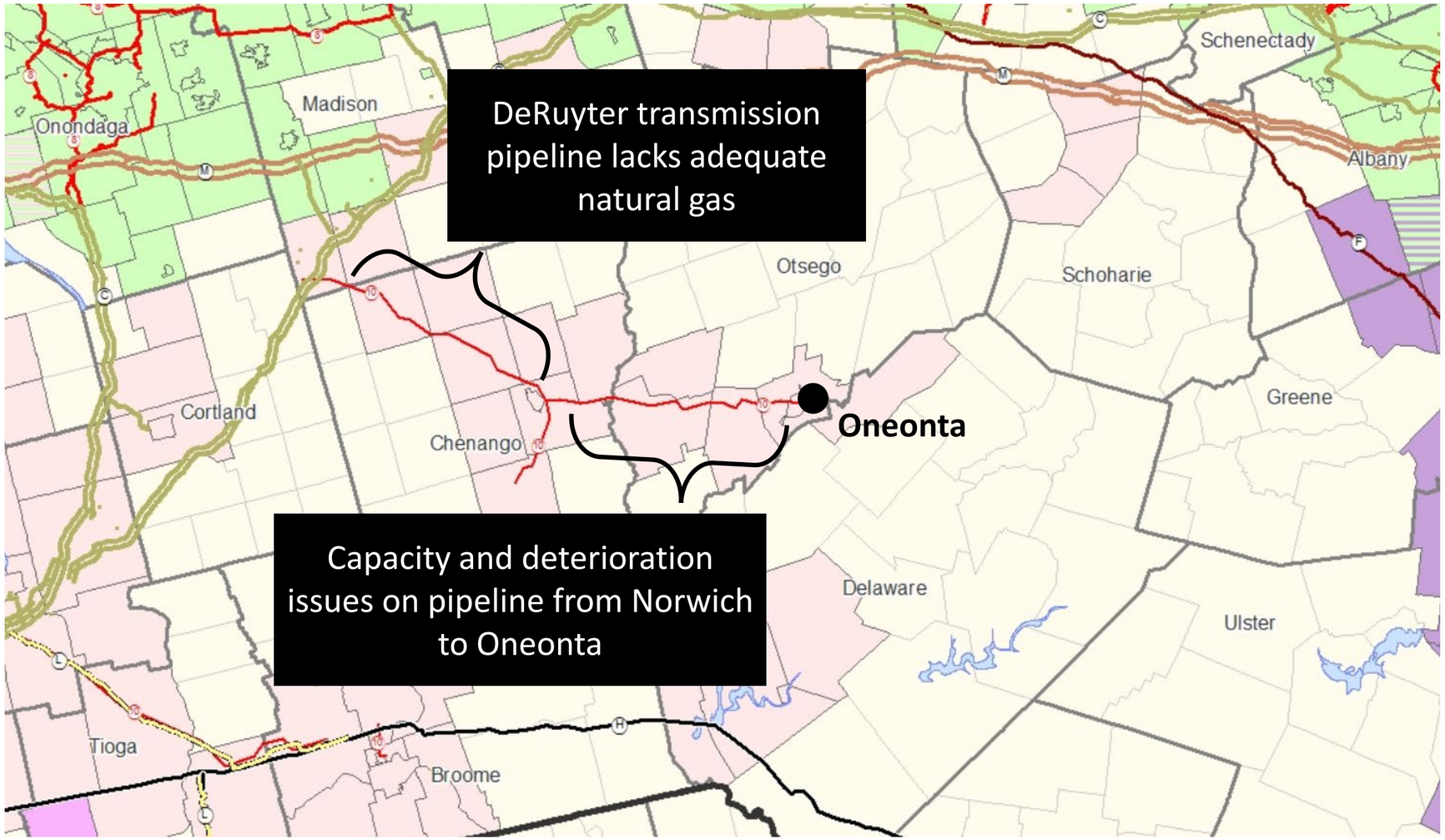
The Vision of a low Carbon Campus
Clean Energy Master Plan - 2020

- Roadmap to decarbonization – 85% by 2045
- Regional energy issues and utility limitations
- Utilize existing energy infrastructure until end of life
- Buildings as components of a larger system
- Keep options open for future decarbonization technology
- Integrate with FMP and educational capital investment

Regional energy issues

Campus Concerns

- Resiliency
- Supporting campus growth



NYSEG Interruptible gas service

59 Interruptions by NYSEG

1,557 hours of interrupted gas service

26.4 hours per interruption average

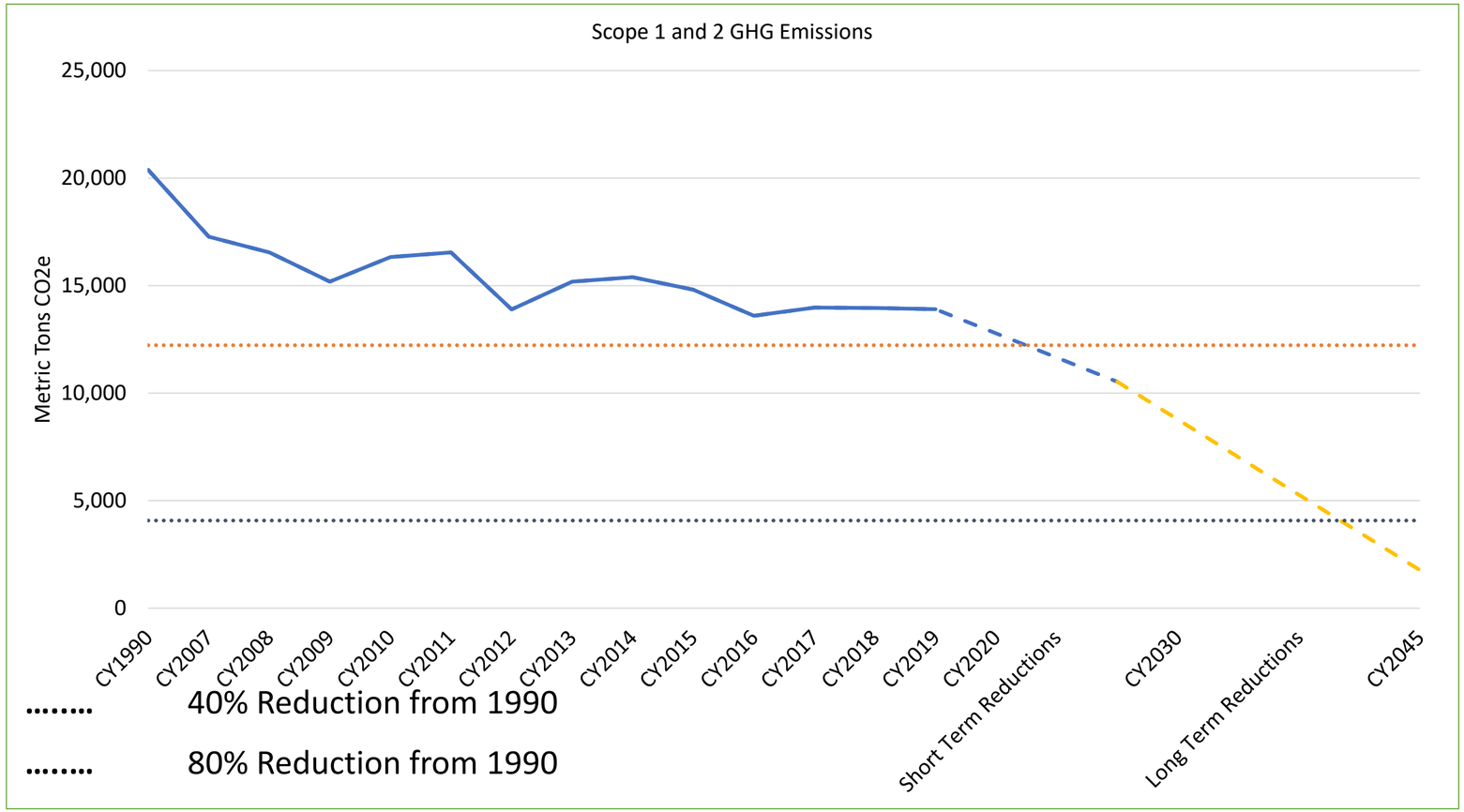
481,200 gallons of #2 fuel oil burned

$750,000
additional expense
About $120,000 annually

The Vision of a low Carbon Campus
Clean Energy Master Plan - 2020

CURRENT	VISION
Distribution networks: • Steam • High or medium temperature hot water	Low temperature hot water distribution system and thermal storage – easy plugin of low carbon technologies
Fossil fuel boilers as base load and peaking	Heat pumps for base load (electrification) Fossil fuel or renewable fuel boilers for peaking and backup
Electricity from the utility grid or microturbines	Electricity from solar PPA Owned solar PV Future renewable energy grid

GHG Emissions Trend
SUNY Oneonta



SHORT TERM REDUCTIONS

- Energy efficiency measures
- Steam to hot water convert
- Renewables
- Stewardship
- Engagement

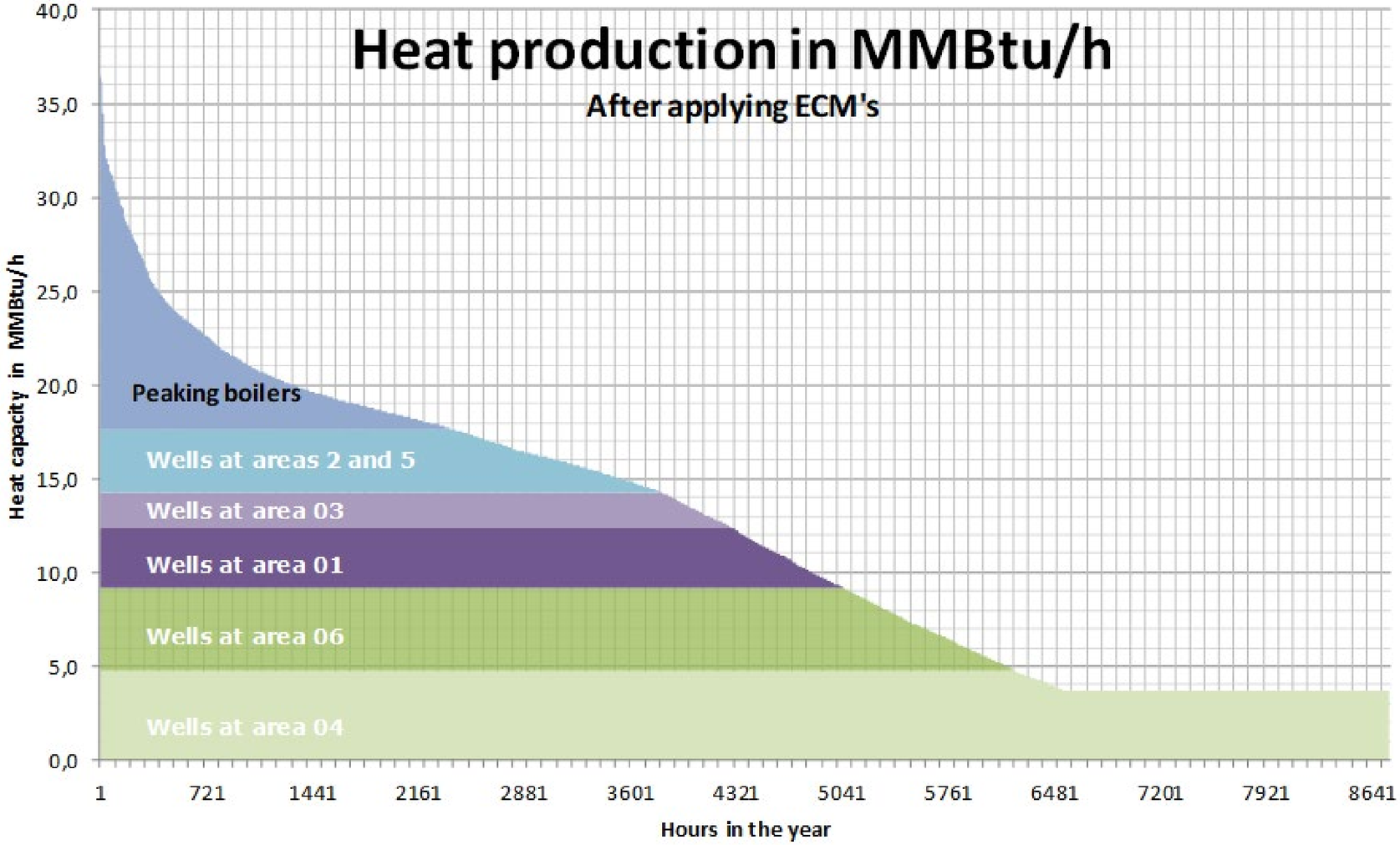
LONG TERM REDUCTIONS

- Facilities Master Plan
- Low carbon energy supply

The Vision of a low Carbon Campus
Clean Energy Master Plan - 2020

- Build distributed Geothermal arrays associated with building renovations
- Energy conservation measures
- Onsite/offsite solar
- Build Thermal storage
- Convert steam and MTHW to Low Temperature Hot water distribution
- Establish new low temp hot water distribution network
- Building level modifications with critical maintenance
- Interconnect district geothermal hot water production
- Fossil Peaking until Central Plant End of Life
- ???

Heat load duration curve

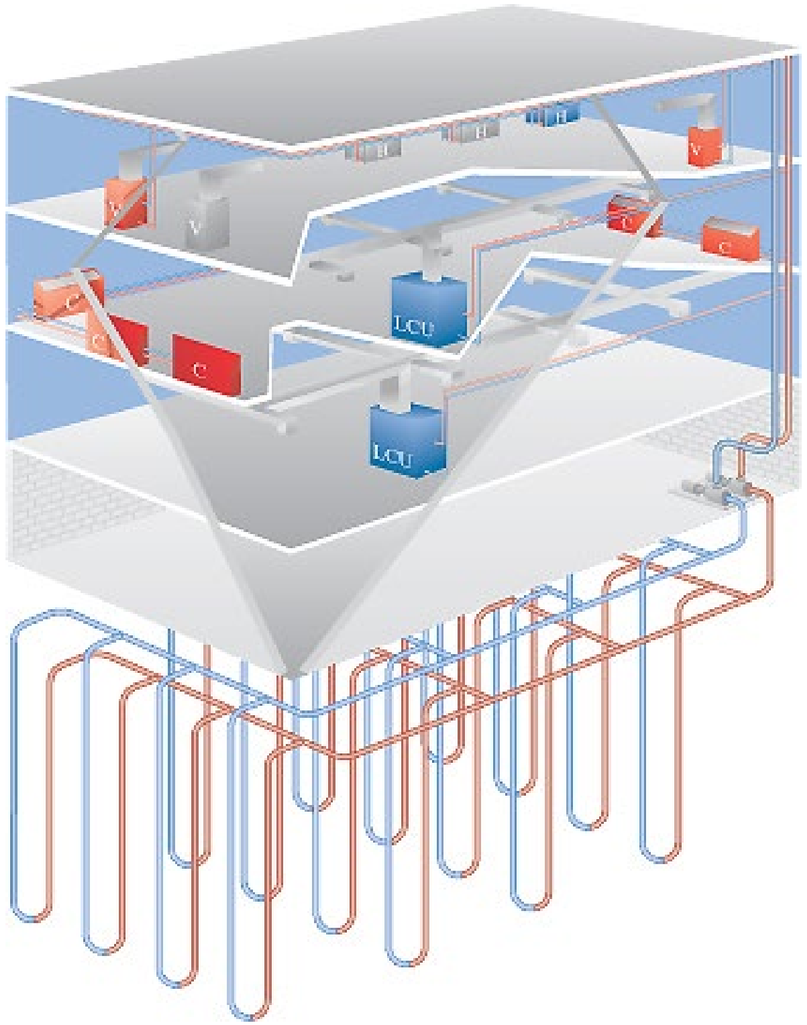


Full Electrification
100% Scope 1&2 Reduction

1000 wells

85% Scope 1&2 Reduction

500 wells



Alumni Hall Renovation – Completed 2023

39 wells @ 499’ deep, Gray Shale at 500’

Thermal conductivity 1.77BTU/hr.-ft-degrees F
Thermal diffusivity 1.33ft$^{2/day}$

Ground Source Heat pumps – Base & Peak

Netzer Hall Renovation – Starts 2025

65wells @ 600’ deep, Oil/Gas concerns

Thermal conductivity 1.86TU/hr.-ft-degrees F
Thermal diffusivity 1.2ft$^{2/day}$

Ground Source Heat pumps – Base fossil peak/Emerg

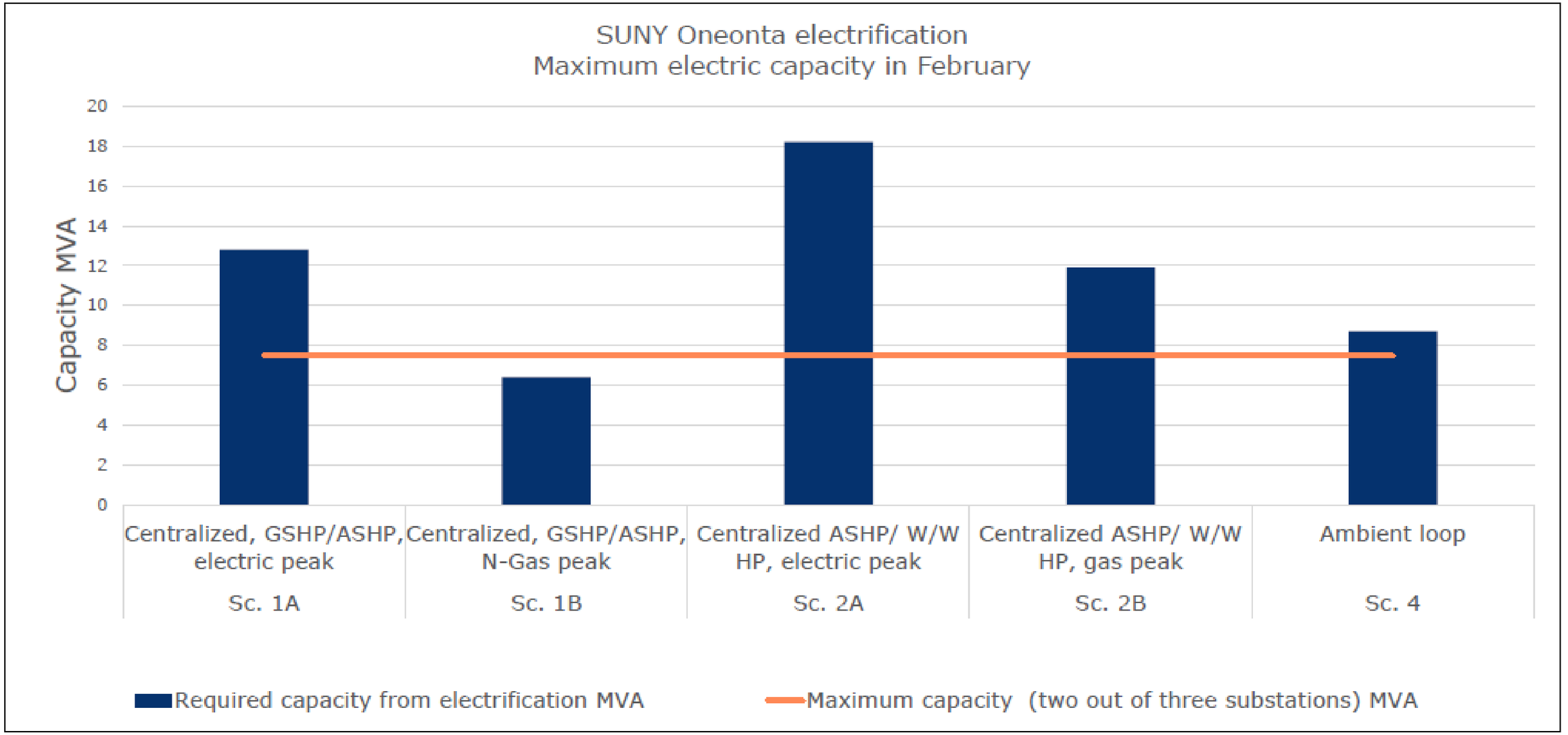
SUNY ONEONTA

091015-00
Rehabilitate Alumni Hall
State University of New York
College at Oneonta

Geothermal - Vertical Loops
Schematic Design Phase

Lacey Thaler Reilly Wilson
Architecture & Preservation, LLP

SUNY Oneonta



Lead By Example!

Geothermal Projects for NYS Facilities

Moderator: Jack DiEnna / *GEO NII*

Panel: Indu Lnu / *University at Albany*

Jim Morier / *NYS DEC*

Lachlan Squair / *SUNY Oneonta*

POLICY & PROGRAMS • ROOM M2A • 11:45 – 12:45 PM